

PATENT COOPERATION TREATY

PCT

REC'D 13 JUL 2005

WIPO

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference W 5529-001 GA/JW		FOR FURTHER ACTION See Form PCT/IPBA/416	
International application No. PCT/SE2004/000755	International filing date (day/month/year) 14.05.2004	Priority date (day/month/year) 14.05.2003	
International Patent Classification (IPC) or national classification and IPC A61N5/01, A61B18/22			
Applicant SpectraCure AB et al			

- This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 7 sheets, including this cover sheet.
- This report is also accompanied by ANNEXES, comprising:
 - ☒ (sent to the applicant and to the International Bureau) a total of 8 sheets, as follows:
 - ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
 - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
 - ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

- This report contains indications relating to the following items:

<input checked="" type="checkbox"/> Box No. I	Basis of the report
<input checked="" type="checkbox"/> Box No. II	Priority
<input checked="" type="checkbox"/> Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
<input type="checkbox"/> Box No. IV	Lack of unity of invention
<input checked="" type="checkbox"/> Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
<input checked="" type="checkbox"/> Box No. VI	Certain documents cited
<input type="checkbox"/> Box No. VII	Certain defects in the international application
<input type="checkbox"/> Box No. VIII	Certain observations on the international application

Date of submission of the demand 13.12.2004	Date of completion of this report 17.06.2005
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88 Form PCT/IPBA/409 (cover sheet) (January 2004)	Authorized officer Johanna Schyberg/EK Telephone No. +46 8 782 25 00

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE2004/000755

Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

- ☐ This report is based on a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

- ☐ the international application as originally filed/furnished
- ☒ the description:
- pages 1-30 _____ as originally filed/furnished
- pages* _____ received by this Authority on _____
- pages* _____ received by this Authority on _____
- ☒ the claims:
- pages _____ as originally filed/furnished
- pages* _____ as amended (together with any statement) under Article 19
- pages* 1-8 received by this Authority on 08.06.2005
- pages* _____ received by this Authority on _____
- ☒ the drawings:
- pages 5 _____ as originally filed/furnished
- pages* _____ received by this Authority on _____
- pages* _____ received by this Authority on _____
- ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to the sequence listing (*specify*): _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to the sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE2004/000755

Box No. II Priority

1. ☒ This report has been established as if no priority had been claimed due to the failure to furnish within the prescribed time limit the requested:
 - ☒ copy of the earlier application whose priority has been claimed (Rule 66.7(a)).
 - ☐ translation of the earlier application whose priority has been claimed (Rule 66.7(b)).
2. ☐ This report has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rule 64.1). Thus for the purposes of this report, the international filing date indicated above is considered to be the relevant date.
3. Additional observations, if necessary:

The priority is valid for those parts of the application which relate to the Swedish priority document. The US priority has not been checked since the ISA does not have access to that priority document.

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE2004/000755

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application

☒ claims Nos. 24 - 25

because:

☒ the said international application, or the said claims Nos. 24 - 25
relate to the following subject matter which does not require an international preliminary examination (*specify*):

See PCT Rule 67.1.(iv) : Methods for treatment of the human or animal body by surgery or therapy, as well as diagnostic methods.

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. _____ are so unclear that no meaningful opinion could be formed (*specify*):

☐ the claims, or said claims Nos. _____ are so inadequately supported by the description that no meaningful opinion could be formed.

☐ no international search report has been established for said claims Nos. _____

☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:

the written form

☐ has not been furnished

☐ does not comply with the standard

the computer readable form

☐ has not been furnished

☐ does not comply with the standard

☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in the Annex C-*bis* of the Administrative Instructions.

☐ See Supplemental Box for further details.

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE2004/000755

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1-23</u>	YES
	Claims	<u>---</u>	NO
Inventive step (IS)	Claims	<u>1-23</u>	YES
	Claims	<u>---</u>	NO
Industrial applicability (IA)	Claims	<u>1-23</u>	YES
	Claims	<u>---</u>	NO

2. Citations and explanations (Rule 70.7)

Reference is made to the following document/documents cited in the International Search Report:

D1: EP0523417 A1
D2: EP0280397 A2
D3: WO02074339 A1
D4: JP4343317 A

Additional documents not cited in the International Search Report:

D5: Johansson T et al, "Feasibility study of a system for combined light dosimetry and interstitial photodynamic treatment of massive tumors", Applied Optics, United States, 2002

The invention concerns a system for interactive interstitial photodynamic and photothermal tumour therapy and tumour diagnosis and solves the problems related to switching between different operation modes in such a system.

D1-D4 represent the general state of the art of the invention.

The document D5 is regarded as being the closest prior art to the subject-matter of claims 1-23 and shows integration of optical dosimetry and diagnosis in an interstitial photodynamic treatment system.

The subject-matter of claims 1-23 therefore differs from this known system in that it discloses an optical switch involving translatory movement, which enables switching between

.../...

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE2004/000755

Box No. VI Certain documents cited

1. Certain published documents (Rule 70.10)

Application No. Patent No.	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
WO 03041575 A1	22.05.2003	11.11.2002	14.11.2002
EP 1314451 A1	28.05.2003	23.11.2001	23.11.2001

2. Non-written disclosures (Rule 70.9)

Kind of non-written disclosure	Date of non-written disclosure (day/month/year)	Date of written disclosure referring to non-written disclosure (day/month/year)
--------------------------------	--	---

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of: BOX V

different operation modes.

The subject-matter of claims 1-23 is therefore novel (Article 33(2) PCT).

The problem to be solved by the present invention may therefore be regarded as providing efficient and compact switching in a system according to D5.

The solution to this problem proposed in claims 1-23 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

- Claims 1-23 suggest a switch involving translatable elements to which optical fibres are attached. By providing translatable movement to the translatable elements, different fibres can be aligned to each other. Such a switch has not been suggested before within the area of endoscopes.
- Integrating such a switch in an endoscope provides a simple, secure and compact switching. It also enables the combination of several switches in one endoscope, e.g. for switching between light sources.
- The cited prior art does not give any indication that would lead a person skilled in the art to the claimed optical switch. Therefore, the claimed invention is not obvious to a person skilled in the art.

Accordingly, the invention defined in claims 1-23 is considered to involve an inventive step. The invention is industrially applicable.

AMENDED CLAIMS 2005-06-08 (755)

1. A system for interactive interstitial photodynamic
or photothermal tumour therapy or tumour diagnosis of a
5 human, comprising;

at least one first light source for emission of
light within the wavelength-range of infrared (IR) visible
or ultraviolet light;

at least one light detector, for detection of light;
10 and

a plurality of optical fibres adapted to conduct
light to or from a tumour site at or in said human, wherein
the optical fibre is in use employed as a transmitter or a
receiver for conduction of light to or from the tumour site
15 for therapy or diagnosis of a tumour at the tumour site;

characterised by

at least one distributor adapted to distribute said
light from at least the first light source to the tumour
site, wherein the distributor comprises at least one
20 longitudinal translatable element having a plurality of said
optical fibres attached thereto and being arranged in such
a manner that light is coupled in different constellations
to or from said optical fibres for a diagnostic or a
therapeutic mode of said system by longitudinal translatable
25 movement of said longitudinal translatable element between
pre-determined positions for aligning said optical fibres
with a corresponding coupling element for transmitting or
receiving said light to or from said light source or said
light detector.

30

2. The system according to claim 1, wherein said system comprising at least one second light source for emission of therapeutic light through at least one of said optical fibres via said distributor via said longitudinal
5 translatory element and said corresponding opposing coupling element to said tumour site.

3. The system according to any of the previous claims, **characterised by**
10 a plurality of first optical fibres arranged for conducting light to or from the tumour site,
a plurality of second optical fibres arranged for delivering light from at least one light source or transmission of light to said at least one light detector,
15 and

wherein said distributor is a distributor for distribution of light from at least one light source to the tumour site and/or from the tumour site to said least one light detector, wherein the opposing coupling element is a
20 second longitudinally translatory element, and being arranged in such a manner that light is coupled in different constellations by translatory movement of a first of said translatory elements between pre-determined positions relative to the other said translatory elements.
25

4. The system according to claim 3, **characterised** in that each translatory element has holes arranged for receiving said optical fibres and that corresponding holes on the two translatory elements are equidistantly arranged
30 on a straight line, and wherein said translatory elements

are configured for transmitting light between the
translatory elements.

5 5. The system according to claim 4, characterised
in that first ends of the first optical fibers are fixed in
the holes of a translatory displacement element and first
ends of second optical fibres are fixed in the holes in the
second translatory element, wherein the first and the
second optical fibres are connectable to each other in
10 different constellations through said longitudinal
translatory movement between pre-determined positions of
the longitudinal translatory displacement element and the
second translatory element relative each other.

15 6. The system according to claim 1, characterised
by further comprising two flat discs in close proximity to
each other, wherein said discs are turnable relatively to
each other,

each disc having holes arranged on a circular
20 line, wherein the circle radius on one disc equals the
circle radius on the other disc and where the holes in one
disc are equally distributed on a circle line with an
angular separation of $v_1 = (360/n_1)$ degrees, n_1 being the
number of holes, and the holes in the other disc are
25 equally distributed on the circle line with an angular
separation of $v_2 = (360/n_2)$ degrees, wherein $n_2 = m \times n_1$, and
wherein m is a multiple, which yields n_2 as an integer ≥ 1 ,
and

30 wherein first ends of third optical fibres are
fixed in the holes of the first disc and first ends of
fourth optical fibres are fixed in all holes of the second

disc except for one, whereby the third and the fourth optical fibres by rotation of the turnable disc relative to the other disc are connectable to each other in different constellations,

5 and wherein said longitudinal translatable element is arranged substantially radially outwards movable and integrated with said other disc to couple between a plurality of said first optical fibres to one of said third optical fibres.

10 7. The system according to claim 6, **characterised** by n_1 being the number of holes in the first disc of the distributor, $n_1 = 6$ and $m = 2$, yielding $n_2 = 12$ holes in the second disc of the distributor.

15 8. The system according to claim 6 or 7, **characterised** by every other fourth optical fibre being part of a first series of fourth optical fibres and that an optical fibre conductor in said first series of fourth optical fibres conductors being arranged for emitting light from the light source and the other optical fibres in said first series of fourth light conductors being arranged for transmission of light to the light detector.

25 9. The system according to claim 7 or 8, **characterised** in said first optical fibres being connected to diagnostic light sources, such that the longitudinal translatable element in said other disc couples one of said diagnostic light sources to one of said third optical fibres in said first disc.

30

10. The system according to any of the previous
claims, **characterised** by the diagnostic light source
5 comprising a beamsplitter.

11. The system according to claim 10 light fibre
being arranged between a dichroic beamsplitter and the
light detector.

10

12. The system according to claim 11 or 12,
characterised by fluorescence being recorded through the
same optical fibre as the one transmitting light to the
tumour site.

15

13. The system according to claim 1,
characterised by the third optical fibres second ends being
treated by a material with temperature sensitive
fluorescence emission.

20

14. The system according to claims 6 or 7,
characterised by every second of said fourth optical fibres
being part of a second series of fourth optical fibres
arranged for emission of light from the light source.

25

15. The system according to any of claims 2 to
14, **characterised** by the therapeutic light source being a
light source for coherent light of a single fixed
wavelength.

30

16. A system according to any of the previous claims, **characterised** by the distributor including means for locking the light distributor into pre-determined transversal and/or azimuthal positions.

5

17. The system according to claim 13, **characterised** in that one or several of the optical fibres which are treated with the material with a temperature sensitive fluorescence emission are in use measuring the temperature at the tumour site,

10

that the light which is sent to the tumour site in use is heating the tumour site, and

that the intensity of the light is controllable by the measured temperature in order to regulate the temperature of the tumour site at the individual optical fibres.

15

18. The system according to any of the previous claims, **characterised** in that said longitudinal translatable displacement element is an optical sledge.

20

19. The system according to any of the previous claims, **characterised** by at least one stepping motor or at least one servo system for moving said elements of said light distributor relative each other.

25

20. The system according to any of the previous claims, **characterised** in that said operation modes are modes of the system comprised in the list of: interactive interstitial photodynamic tumour therapy, photothermal tumour therapy using hyperthermia, and tumour diagnostics,

30

whereby these operation modes in use are alternated during the same occasion of treatment of said tumour site.

21. The system according to any of claims 2 to
5 20, **characterised** by said operation modes of said system comprising

a diagnostic operation mode, wherein one
diagnostic light source is coupled via a first longitudinal
translatory element to said first optical fibres
10 transmitting diagnostic light to said site and the
remaining first optical fibres are coupled to a light
detector, and

a therapeutic operation mode, wherein said
therapeutic light sources are coupled to said first optical
15 fibres transmitting therapeutic light to said site.

22. The system according to claim 21,
characterised in that at least one second longitudinal
translatory element switches between the operating modes.
20

23. The system according to claim 22,
characterised in that a third longitudinal translatory
element is configured to switch between a plurality of
optical fibres from said second longitudinal translatory
25 element to said light detector.

24. A method for interactive interstitial photo-
dynamic tumour therapy or photothermal tumour therapy or
tumour diagnosis of a human, wherein at least one light
30 detector and a plurality of optical fibres are connected to
a tumour site and the optical fibres are used as a

transmitter or a receiver for conduction of light to or from a tumour site for diagnosis and therapy of a tumour at the tumour site,

characterised in that the switching between
5 tumour therapy and tumour diagnostics is achieved in an automatised way by switching light fibres between different constellations by means of a light distributor comprised in the system according to any of claims 1 to 23, and

that the results from the diagnostics control the
10 therapy process by regulating a therapeutical light intensity depending on the results of the diagnostics until an optimal treatment of the tumour site is achieved.

25. The method according to claim 24,
15 characterised by alternately utilising interactive interstitial photodynamic tumour therapy, photothermal tumour therapy using hyperthermia, and tumour diagnostics during the same occasion of treatment of said tumour site.